

Page 6, line 5: Replace this one-line heading with the following new heading:

BRIEF DESCRIPTION OF THE DRAWINGS

Page 8, line 23: Replace this one-line heading with the following new heading:

DETAILED DESCRIPTION OF THE INVENTION

Page 20, line 9: Delete this one-line heading.

Page 21, line 1: Replace this one-line heading with the following new heading:

CLAIMS

Page 26, line 1: Replace this one-line heading with the following new heading:

ABSTRACT

Page 26, line 2: Delete this one-line heading.

Page 26, line 10: Delete this one-line paragraph.

IN THE CLAIMS

Please cancel claim 2 without prejudice or disclaimer.

In accordance with 37 C.F.R. §1.121(c)(3), please substitute for pending claims 1 and 3-33 the following rewritten versions of the same claims, of which claims 1 and 4 are amended. The changes are shown explicitly in the attached "Marked-up Version Showing Changes Made."

Serial No. 09/384,419

B1

1. (Twice Amended) A loudspeaker comprising a resonant panel-form member and a vibration exciting system on the panel-form member and adapted to apply bending wave energy thereto to cause the panel-form member to produce an acoustic output, wherein the vibration exciting system is adapted to apply torsion to the panel-form member.

3. A loudspeaker according to claim 1, wherein the vibration exciting system is adapted to apply shear to the panel-form member.

B2

4. (Twice Amended) A loudspeaker according to claim 3, wherein the vibration exciting system is coupled to the panel-form member to span a plurality of nodal lines in the panel-form member.

5. A loudspeaker according to claim 1, wherein the vibration exciting system comprises a suspension on which the panel-form member is mounted, the suspension acting as a pivot about which at least a portion of an edge of the panel-form member local to the vibration exciting system can hinge.

6. A loudspeaker according to claim 5, wherein the suspension is of a plastics foam of high shear stiffness.

7. A loudspeaker according to claim 1, wherein the vibration exciting system comprises a piezoelectric device attached to the panel-form member to apply a bending couple thereto by introducing alternating tension and compression to the panel-form member in the plane thereof.

8. A loudspeaker according to claim 7, wherein the piezoelectric device is attached to a face of the panel-form member.

9. A loudspeaker according to claim 8, comprising mirror-image piezoelectric devices attached to opposite faces of the panel-form member.

Serial No. 09/384,419

10. A loudspeaker according to claim 7, wherein the piezoelectric device has a portion disposed adjacent to the suspension, and a portion disposed remotely from the suspension.
11. A loudspeaker according to claim 7, wherein the piezoelectric device is a thin strip-like device fixed to the panel-form member by adhesive.
12. A loudspeaker according to claim 7, wherein the piezoelectric device is a unimorph device.
13. A loudspeaker according to claim 12, wherein the unimorph device comprises opposed parts arranged such that one part increases in length while the other part contracts.
14. A loudspeaker according to claim 1, claim 5 or claim 7, wherein the panel-form member is transparent.
15. A loudspeaker according to claim 14, wherein the piezoelectric device is transparent.
16. A loudspeaker according to claim 7, wherein the piezoelectric device is of PZT.
17. A loudspeaker according to claim 1 or claim 5, wherein the vibration exciting system comprises an inertial device.
18. A loudspeaker according to claim 17, wherein the inertial device comprises an inertial mass rigidly fixed to the panel-form member to form a suspension pivot.
19. A loudspeaker according to claim 17, wherein the inertial device is an inertial vibration exciter.
20. A loudspeaker according to claim 19, comprising opposed inertial vibration exciters on opposite sides of the panel-form member.
21. A loudspeaker according to claim 19, comprising an additional inertial vibration exciter on the panel-form member and coupled to the first said inertial vibration exciter in anti-phase to damp unwanted whole body movement of the panel-form member.

Serial No. 09/384,419

22. A loudspeaker according to claim 1 or claim 5, wherein the vibration exciting system comprises an electrodynamic motor having a rotor with a current-carrying conductor array fixed to the panel-form member with its axis parallel to the plane of the member to apply torsion thereto, and a magnet forming a magnetic field in which the rotor is positioned.
23. A loudspeaker according to claim 1 or claim 5, wherein the vibration exciting system comprises a bimorph piezoelectric device which is generally rectangular and orientated diagonally to act as a twister.
24. A loudspeaker according to claim 1 or claim 5, wherein the vibration exciting system comprises an element rigidly coupled to and projecting away from the panel-form member, and an exciter which induces bending moments in the element.
25. A loudspeaker according to claim 24, wherein the element is generally perpendicular to the panel-form member, bending moments are produced by displacement in a part of the element spaced from the panel-form member, and the displacement is generally perpendicular to the element.
26. A loudspeaker according to claim 25, wherein the displacement is effected using a piezoelectric device.
27. A loudspeaker according to claim 25, wherein the displacement is effected by an inertial device.
28. A method of making a loudspeaker having a resonant panel-form member adapted to be excited to produce an acoustic output by the application of bending wave energy, comprising defining the panel-form member, mapping the panel-form member to determine the location of nodal lines, arranging a vibration exciting system on the panel-form member to apply bending wave energy thereto, with the exciting system spanning a plurality of the

Serial No. 09/384,419

nodal lines and mounting the vibration system exciting to the panel-form member to apply a couple thereto.

29. A method according to claim 28, wherein the panel-form member is defined in terms of geometry, size and/or mechanical impedance.
30. A method according to claim 28 or claim 29, wherein the panel-form member is mapped using finite element analysis.
31. A method according to claim 28, comprising mounting the panel-form member on a suspension such that the suspension acts as a pivot about which an adjacent portion of the panel-form member can hinge, and arranging and mounting a vibration exciter on the adjacent portion of the panel-form member to bend the panel-form member.
32. A vibration exciter for applying bending wave energy to a stiff resonant loudspeaker panel-form member and adapted to apply a bending couple to the member.
33. A loudspeaker according to claim 1, wherein the vibration exciter is coupled to the panel-form member to span a plurality of nodal lines in the panel-form member.